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...THE...

AMERICAN FERTILIZER

"That man is a benefactor to his race who makes two blades of grass to grow where but one grew before."

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Relationship between Farm Income and Farmers' Expenditures for Fertilizer and a Forecast of the Commercial Demand for Fertilizer in 1944 and 1945 by States

By A. L. Mehring, Chemist, and B. T. Shaw Senior Agronomist

Division of Soil and Fertilizer Investigations
Bureau of Plant Industry, Soils, and Agricultural Engineering
Agricultural Research Administration
U. S. Department of Agriculture
Beltsville, Maryland

THE RELATIONSHIP between total farmer expenditure for fertilizers and national farm income has been investigated by Vial (5)*, Willett (6), Kriesel (2) and Brodell and Cooper (1). These studies have shown that for the period 1903 to 1939 on the average, from 2 to 3 per cent of the national farm income in any year was spent for fertilizers in the following year.

Vial compared fertilizer consumption in a given year with the previous year's acre value of four crops and the previous two years' fertilizer consumption. In the other studies the total farm expenditure for fertilizers was calculated and compared with either gross or cash income. The expenditure for fertilizers was calculated from the fertilizer tonnage and the average price of a fixed list of fertilizers so chosen as to represent a fair cross-section of farm purchases. This method of calculation gives a fairly accurate figure for expenditures during the base period but extrapolations in either direction from the base period are likely to be in error due to changes in the plant-food content of the average mixture and changes in the kind of materials and mixtures bought. A more accurate estimate of expenditures is given by the product of the average retail price of a unit of plant-food, the number of units per ton of fertilizer, and the tonnage of fertilizer sold, determined separately for each year.

Fertilizer tonnage, average percentage of plant-food, and average retail price per unit of plant-food for the total fertilizer consumed in Continental United States for the years 1880, 1890 and 1900 to 1943, inclusive, are given in Table I.† These basic data were used to calculate the expenditures for fertilizer given in Table II. Gross income, cash income, and total crop value along with cents spent for fertilizer per dollar of each of these are also given in Table II.

The relationships between expenditure for fertilizer and the three expressions of previous year's farm income are shown in Fig. 1. Even though fertilizer tonnage fluctuated widely from 1,150,000 tons in 1880 to 10,600,000 tons in 1943 and prices varied considerably, the correlation between expenditures and previous year's income has been very close. The cents spent for fertilizer per dollar of previous year's gross income has remained remarkably constant for 64 years.

Farmers spent on the average 2.27 ± .03 cents out of each dollar of previous year's gross income for fertilizers in the years 1880 to 1943, inclusive. The greatest variation from the mean in the entire period was 0.81 cents. The standard deviation is 0.29 cents and the coefficient of variation is 12.9. For cash income in the years 1911 to 1943, inclusive, the figures are: mean, 2.68 ± .04 cents; maxi-

†Tonnages to 1936 were taken from Willett (6). For subsequent years the latest available reports of the National Fertilizer Association were used. The average retail cost per unit of plant-food was obtained from Mehring (3) to 1935 and estimated in a similar manner for the other years. The average percentage plant-food contained in fertilizers was determined from data on file in this office in the manner described by Mehring and Deming (4).

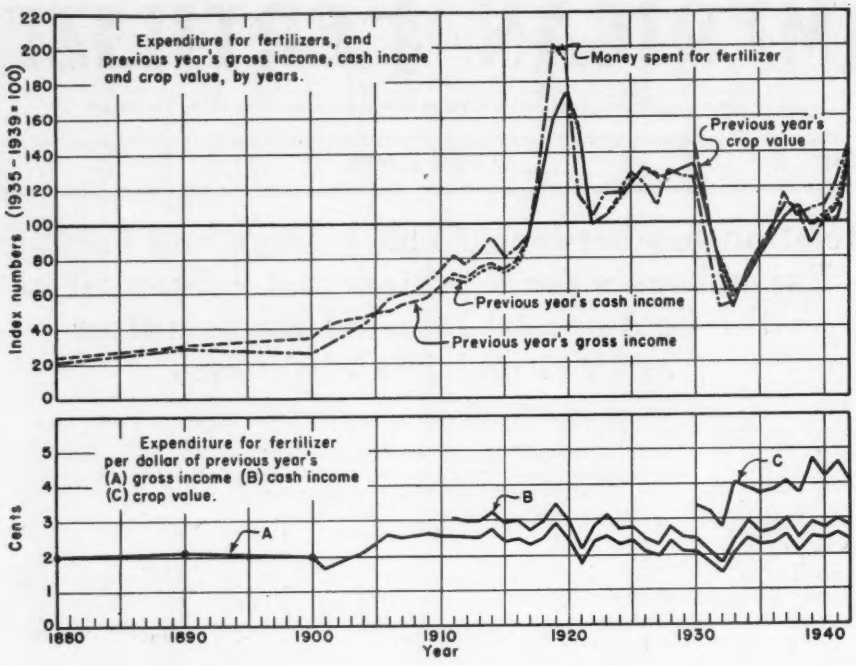

Fig. 1. Relationship between expenditure for fertilizers and previous year's income in the United States

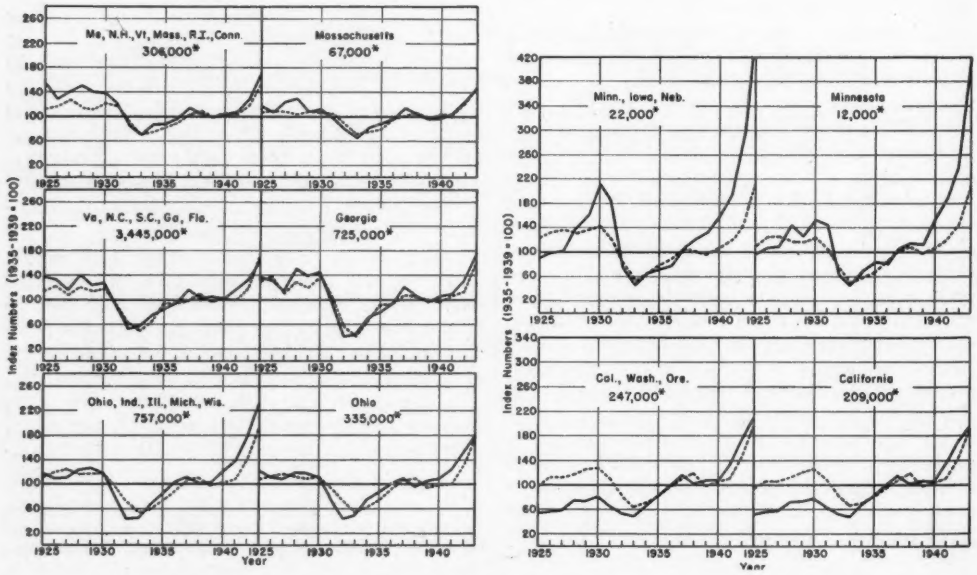

Fig. 2. Relationship between money spent for fertilizer (——) and previous year's income (- - - -) in certain States and regions
***1935-1939 average fertilizer tonnage**

mum deviation, 0.66 cents; standard deviation, 0.27 cents; and coefficient of variation 10.1. For total crop value in the years 1930 to 1943, inclusive, the figures are: mean, 3.83 ± .07 cents; maximum deviation, 0.88 cents; standard deviation, 0.40 cents; and coefficient of variation, 10.5. Any of the three expressions of income may be used to forecast fertilizer demand with almost equal chances of success but the odds are slightly in favor of cash income.

The relationship between expenditures for fertilizer and previous year's cash income for certain States and Regions is shown in Fig. 2. The data used in preparing the graph are given in Table III. The correlation between previous year's cash income and expenditures for fertilizer is close on a Regional and State basis as well as on a National basis. The correlation for Massachusetts is even closer than for the New England region. The same is also true for Minnesota as compared with the three States, Minnesota, Iowa, and Nebraska. This is perhaps a reflection of better tonnage figures for some States than others.

The trend in fertilizer purchase in relation to previous year's cash income is shown in a little better perspective for the different regions in Fig. 3. In this figure, cents spent for fertilizer out of each dollar of the previous year's cash income are shown for the years 1925 to 1943. There is little evidence of either an upward or downward trend in fertilizer purchase in relation to income. The figures for the South Atlantic region have fluctuated around 14 cents out of each dollar, for New England around 5 cents, and for the Midwest around 1.6 cents. These regions are representative of the area in which most of the fertilizer is consumed. A definite upward trend in fertilizer use in relation to income is evident for the Pacific Coast States. In the last twenty years expenditures for fertilizer have increased from about 0.7 cents out of each dollar of previous year's cash income to about 1.5 cents. There seems to be an upward trend in the west north central region beginning about 1936. The expenditure in 1943, however, was still under 0.2 cents out of each dollar of previous year's cash income.

Average fertilizer tonnage, expenditures for fertilizer, previous year's cash income, and expenditures for fertilizer per dollar of income are given in Table IV, State by State, for the period 1935 to 1939. The State index of the

TABLE I

FERTILIZER TONNAGE, AVERAGE TOTAL PLANT-FOOD CONTENT, AND AVERAGE RETAIL PRICE OF A UNIT OF PLANT-FOOD OF COMMERCIAL FERTILIZERS PURCHASED BY FARMERS IN CONTINENTAL UNITED STATES BY YEARS

Year	Tonnage 1,000 tons	Total plant-food content per cent	Average retail price per unit of plant-food dollars	Year	Tonnage 1,000 tons	Total plant-food content per cent	Average retail price per unit of plant-food dollars
1880	1,150	13.5	2.98	1920	7,177	15.5	3.74
1890	1,950	14.2	2.29	1921	4,863	15.8	3.33
				1922	5,670	16.1	2.47
1900	2,200	14.3	1.81	1923	6,442	16.3	2.41
1901	2,500	14.4	1.82	1924	6,825	16.5	2.26
1902	2,770	14.5	1.83				
1903	3,075	14.6	1.85	1925	7,333	16.5	2.32
1904	3,360	14.7	1.87	1926	7,328	16.8	2.18
				1927	6,843	17.0	2.05
1905	3,850	14.9	1.87	1928	7,985	17.5	2.11
1906	4,450	15.0	1.86	1929	7,975	17.6	1.97
1907	4,452	15.1	1.91				
1908	4,525	15.3	1.95	1930	8,163	17.8	1.90
1909	4,912	15.5	1.92	1931	6,306	17.9	1.67
				1932	4,336	17.6	1.46
1910	5,452	15.5	1.87	1933	4,871	17.9	1.33
1911	6,024	15.4	1.89	1934	5,548	18.1	1.56
1912	5,767	15.4	1.85				
1913	6,337	15.4	1.83	1935	6,221	18.4	1.55
1914	7,100	15.4	1.84	1936	6,820	18.6	1.62
				1937	8,200	18.8	1.64
1915	5,323	15.3	2.14	1938	7,490	18.9	1.60
1916	5,125	14.2	2.56	1939	7,613	19.1	1.60
1917	5,925	13.3	2.60				
1918	6,466	13.1	3.65	1940	7,846	19.4	1.56
1919	6,625	15.4	4.33	1941	8,389	19.8	1.60
				1942	8,779	19.6	1.82
				1943	10,600	19.7	1.93

TABLE II

RELATIONSHIPS BETWEEN FARMERS' EXPENDITURE FOR FERTILIZER AND PREVIOUS YEAR'S GROSS INCOME, CASH INCOME, AND TOTAL CROP VALUE FOR CONTINENTAL UNITED STATES BY YEARS

Year	Expenditure for fertilizer	Previous year's gross income *	Expenditure for fertilizer per dollar of previous year's gross income	Previous year's cash income *	Expenditure for fertilizer per dollar of previous year's cash income	Previous year's total crop value **	Expenditure for fertilizer per dollar of previous year's crop value
	$1,000	$1,000,000	cents	$1,000,000	cents	$1,000,000	cents
1880	46,264	2,324	1.99	....	....	....	....
1890	63,410	3,000	2.11	....	....	....	....
1900	56,943	3,424	1.95	....	....	....	....
1901	65,520	3,873	1.68	....	....	....	....
1902	73,502	4,179	1.75	....	....	....	....
1903	83,056	4,454	1.86	....	....	....	....
1904	92,363	4,467	2.06	....	....	....	....
1905	107,272	4,701	2.28	....	....	....	....
1906	124,155	4,760	2.60	....	....	....	....
1907	128,400	5,155	2.49	....	....	....	....
1908	135,004	5,342	2.52	....	....	....	....
1909	146,181	5,520	2.64	....	....	....	....
1910	158,026	6,143	2.57	....	....	....	....
1911	175,335	6,970	2.51	5,793	3.02	....	....
1912	164,302	6,689	2.45	5,597	2.91	....	....
1913	178,591	7,157	2.49	6,017	2.96	....	....
1914	201,186	7,401	2.71	6,249	3.22	....	....
1915	174,287	7,212	2.41	6,050	2.88	....	....
1916	186,304	7,535	2.47	6,404	2.90	....	....
1917	204,888	9,058	2.26	7,750	2.64	....	....
1918	309,173	12,607	2.45	10,746	2.87	....	....
1919	441,768	15,613	2.82	13,461	3.28	....	....
1920	416,053	16,997	2.44	14,602	2.84	....	....
1921	255,861	15,013	1.70	12,608	2.02	....	....
1922	225,479	9,717	2.32	8,150	2.76	....	....
1923	253,062	10,149	2.49	8,594	2.94	....	....
1924	254,505	11,185	2.27	9,562	2.66	....	....
1925	280,708	11,843	2.37	10,220	2.74	....	....
1926	268,380	12,777	2.12	10,996	2.44	....	....
1927	238,479	12,400	1.92	10,564	2.25	....	....
1928	294,847	12,451	2.36	10,756	2.74	....	....
1929	276,509	12,738	2.17	11,072	2.49	....	....
1930	276,072	12,995	2.12	11,296	2.44	8,224	3.35
1931	188,505	10,557	1.78	9,020	2.08	5,819	3.23
1932	111,418	7,624	1.46	6,371	1.74	4,071	2.73
1933	115,964	5,752	2.01	4,743	2.44	2,859	4.05
1934	156,654	6,468	2.42	5,445	2.87	4,101	3.81
1935	177,422	7,870	2.25	6,780	2.61	4,779	3.71
1936	205,500	8,980	2.28	7,659	2.68	5,419	3.79
1937	252,822	10,028	2.52	8,654	2.92	6,269	4.03
1938	226,498	10,627	2.13	9,217	2.45	6,108	3.70
1939	232,653	9,451	2.46	8,168	2.84	4,930	4.71
1940	237,451	9,928	2.39	8,684	2.73	5,705	4.16
1941	265,763	10,338	2.57	9,106	2.91	5,775	4.60
1942	313,164	13,142	2.38	11,743	2.66	7,739	4.04
1943	404,668	17,868	2.26	16,177	2.50	10,947	3.69

*Gross income includes cash income and value of products consumed in farm household. Cash income includes Government benefit payments 1880–1910, U. S. D. A. Technical Bul. 703. Gross Farm Income and Indices of Farm Production and Prices in the U. S. 1869–1937. 153 pages Illus.

1911–1943, U. S. D. A. Bureau of Agri. Econ. Mimeographs, Cash Farm Income, Government Payments, and Value of Products Consumed on Farms, by States 1924–41, and U. S. 1910–41. July 1942. 1940–1942. June 1943.

**U. S. D. A. Agricultural Statistics.

price paid for an average ton of fertilizer in relation to the United States price of an average ton is also given in the table. These indexes were calculated from available price data, principally 1934 prices which were available for each State (3). Account was taken of differences in mixtures and materials bought and also the total plant-food content of the average ton. The total average expenditure for fertilizer calculated on the basis of these indexes, for the period 1935 to 1939, for continental United States was $221,000,000. This differs from the average for the same period given in Table II—$218,979,000—by about 1 per cent. Since these two figures represent independent calculations, and since they agree to two significant figures, the accuracy justified in Table IV, it is believed that the State indexes are reasonably accurate.

In Table V, cents spent for fertilizer out of each dollar of previous year's cash income for the regions shown in Fig. 3 and for a selected State from each region are given for the years 1925 to 1943.

Relation Between Farm Income and Plant-food Consumption

The price of fertilizer normally varies with the demand and with the supply. As a consequence of frequent price changes, the correlation between farm income and pounds of plant-food bought in the following year is not nearly as close as that between income and dollars spent for fertilizer. The demand is created principally by the cash income in the previous season, and consequently the farmer's ability to buy, and to a less extent by prospects of a good market for farm products at the time of fertilizer purchase. Nevertheless, plant-food consumption and farm income are directly related, if price is held constant or they can be correlated through price as an intermediate function.

The average number of tons of nitrogen, phosphoric acid and potash purchased annually in each State in the three-year period 1939 to 1941 and the average cash farm income for the three-year period 1938 to 1940 are given in Table VI. From these data the pounds of plant-food purchased were calculated per dollar of previous year's cash income. These figures are intended to serve as a base for estimates of future demand for nitrogen, phosphoric acid and potash on a tonnage basis. It was, therefore, desirable to use the latest available data that would be satisfactory. The consumption figures for the period mentioned above seemed best suited for this purpose.

Forecasting Fertilizer Demand

Since the relationship between expenditures for fertilizer and previous year's income has remained almost constant from 1880 right up to 1943 there is no reason to suppose that it will not hold approximately as well for the next few years. Accordingly preliminary 1943 cash-farm-income figures were used in connection with the figures in Table VI to forecast the demand for plant-food in 1944. The average price per unit of plant-food in 1944 has increased to an index number of 120.5 when the 1939–1941 average is taken as 100. If we assume that prices increased equally on a percentage basis in all parts of the country, which is a fair approximation of the truth, although not exactly so, the same income in 1943 would buy only 82.4 per cent as much fertilizer in 1944 as it would have in 1939–41. The figures were, therefore, uniformly calculated to 82.4 per cent of what they apparently would have been if prices had remained constant. The forecast for 1944, by States and United States, is presented in Table VII. This forecast indi-

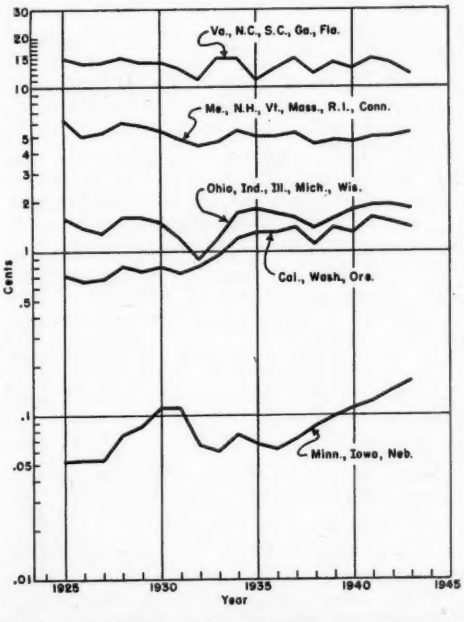

Fig. 3. Expenditure for fertilizer in cents per dollar of previous year's cash income in certain regions

TABLE III

RELATIVE PRICE OF FERTILIZERS PER TON IN THE UNITED STATES, 1925–1943, AND THE RELATIVE TONNAGES OF FERTILIZER, EXPENDITURE FOR FERTILIZERS, AND PREVIOUS YEAR'S CASH INCOME IN CERTAIN REGIONS AND STATES, 1925–1943

Index numbers 1935–1939 = 100

	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943
Relative price of fertilizer per ton (U. S.)	128	122	116	123	116	113	100	86	79	94	95	100	103	101	102	101	106	119	127
Me., N. H., Vt., Mass., R. I., Conn.																			
Relative tonnages of fertilizer	120	105	120	121	121	122	120	99	89	92	93	96	111	102	97	102	102	107	134
Relative expenditure for fertilizer	154	128	139	149	140	138	120	85	70	86	88	96	114	103	99	103	108	127	170
Relative previous year's cash income	112	116	125	115	112	120	117	90	71	74	82	89	102	107	98	104	103	118	152
Massachusetts																			
Relative tonnages of fertilizer	93	88	107	105	93	99	97	92	82	86	94	96	111	103	95	97	99	105	116
Relative expenditure for fertilizer	119	107	124	129	108	112	97	79	65	81	89	96	114	104	97	98	105	125	147
Relative previous year's cash income	107	110	108	104	108	106	105	88	72	74	79	93	101	105	98	104	103	122	147
Va., N. C., S. C., Fla., Ga.																			
Relative tonnages of fertilizer	107	108	100	114	107	112	90	63	74	80	88	94	113	101	103	101	109	112	129
Relative expenditure for fertilizer	137	132	116	140	124	127	90	54	58	75	84	94	116	102	105	102	116	133	164
Relative previous year's cash income	114	122	108	120	114	117	92	63	49	64	94	93	98	110	97	102	99	119	175
Georgia																			
Relative tonnages of fertilizer	107	108	98	122	120	128	95	49	57	76	85	94	119	106	95	105	105	111	138
Relative expenditure for fertilizer	137	132	114	150	139	145	95	42	45	71	81	94	122	107	97	106	111	132	175
Relative previous year's cash income	129	138	110	129	121	138	105	57	42	67	93	92	108	105	98	97	107	114	162
Ohio, Ind., Ill., Mich., Wis.																			
Relative tonnages of fertilizer	92	90	95	100	109	105	79	50	56	71	88	103	108	101	100	119	129	149	184
Relative expenditure for fertilizer	118	110	110	123	126	119	79	43	44	67	84	103	111	102	102	120	137	177	234
Relative previous year's cash income	111	119	123	116	116	119	99	72	53	59	71	88	105	109	97	101	107	140	190
Ohio																			
Relative tonnages of fertilizer	96	91	93	96	101	98	74	50	62	79	91	101	108	97	103	108	117	128	142
Relative expenditure for fertilizer	123	111	108	118	117	111	74	43	49	74	86	101	111	98	105	109	124	152	180
Relative previous year's cash income	107	112	116	113	108	112	93	72	53	61	73	92	106	109	94	99	99	130	178
Minn., Iowa, Neb.																			
Relative tonnages of fertilizer	70	80	86	112	138	188	181	88	56	68	75	76	101	120	128	155	182	238	372
Relative expenditure for fertilizer	90	98	100	138	160	212	181	76	44	64	71	76	104	121	131	157	193	283	472
Relative previous year's cash income	124	132	137	131	136	142	121	83	53	61	77	88	106	102	97	106	119	146	213
Minnesota																			
Relative tonnages of fertilizer	75	94	94	118	108	135	147	77	60	76	89	82	103	114	112	154	176	208	330
Relative expenditure for fertilizer	96	105	109	145	125	153	147	66	47	71	85	82	106	115	114	156	187	248	419
Relative previous year's cash income	109	125	126	119	118	124	106	75	51	59	68	85	103	109	99	105	121	147	209

TABLE III (Continued)

	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943
Calif., Wash., Ore.																			
Relative tonnages of fertilizer	42	46	50	59	63	71	64	60	59	69	85	98	112	101	104	105	126	146	165
Relative expenditure for fertilizer	54	56	58	73	73	80	64	52	47	65	81	98	115	102	106	106	134	174	210
Relative previous year's cash income	97	111	111	117	125	128	111	82	64	69	80	95	108	119	97	104	109	145	194
California																			
Relative tonnages of fertilizer	41	45	49	58	62	68	63	61	60	71	85	99	111	100	104	104	127	144	154
Relative expenditure for fertilizer	52	55	57	71	72	77	63	52	47	67	81	99	115	101	106	105	135	171	196
Relative previous year's cash income	93	105	105	112	120	126	110	83	66	69	80	94	108	120	97	103	110	144	188

(See Page 26 for Table IV)

TABLE V

EXPENDITURES FOR FERTILIZER IN CENTS PER DOLLAR OF PREVIOUS YEAR'S CASH INCOME FOR CERTAIN REGIONS AND STATES, 1925 TO 1943. (STATE PRICE PER TON OF FERTILIZER CALCULATED FROM U. S. PRICE AND STATE PRICE INDEX IN TABLE IV)

	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943
Me., N. H., Vt., Mass., R. I., Conn.	6.4	5.0	5.2	6.0	5.8	5.4	4.8	4.4	4.6	5.4	5.0	5.0	5.2	4.5	4.7	4.6	4.9	5.0	5.2
Massachusetts	3.4	3.0	3.5	3.8	3.1	3.3	2.9	2.8	2.8	3.4	3.5	3.2	3.5	3.1	3.1	2.9	3.2	3.2	3.1
Va., N. C., S. C., Ga., Fla.	.15.	14.	14.	15.	14.	14.	13.	11.	15.	15.	11.	13.	15.	12.	14.	13.	15.	14.	12.
Georgia	.13.	12.	13.	14.	14.	13.	11.	9.	13.	13.	11.	13.	14.	12.	12.	13.	13.	14.	13.
Ohio, Ind., Ill., Mich., Wis.	1.6	1.4	1.3	1.6	1.6	1.5	1.2	.89	1.2	1.7	1.8	1.7	1.6	1.4	1.6	1.8	1.9	1.9	1.8
Ohio	3.5	3.0	2.8	3.2	3.3	3.0	2.4	1.8	2.8	3.7	3.6	3.4	3.2	2.8	3.4	3.4	3.8	3.6	3.1
Minn., Iowa, Neb.	.052	.053	.053	.076	.085	.11	.11	.066	.060	.076	.067	.062	.071	.085	.097	.11	.12	.14	.16
Minnesota	.12	.12	.12	.17	.15	.17	.19	.12	.13	.17	.17	.13	.14	.15	.16	.21	.22	.23	.28
Calif., Wash., Ore.	.71	.65	.67	.80	.75	.80	.74	.81	.94	1.2	1.3	1.3	1.4	1.1	1.4	1.3	1.6	1.5	1.4
California	.85	.80	.82	.96	.91	.93	.87	.95	1.1	1.5	1.5	1.6	1.6	1.3	1.7	1.5	1.9	1.8	1.6

cates that farmers, exclusive of those in Hawaii and Puerto Rico, would buy in 1944, 692,000 tons of nitrogen, 1,294,000 tons of phosphoric acid and 722,000 tons of potash if those quantities were freely offered at present prices. Regional and National totals given in Table VII are the sums of the separate State figures. If these totals were calculated from the Regional and National data in Table VI, slightly different, although less accurate, figures would be obtained. This results from the fact that the individual State incomes in one year do not bear the same weight to the National total as they do in another year. In 1943 the cash farm income in the high fertilizer-consuming States (Middle Atlantic, South Atlantic, and South Central) did not increase to the same extent as did the National cash income.

This estimate should not be construed to have equal accuracy in all States or the same accuracy for individual States as for the United States. As shown above, the probable error in the estimate for the United States is approximately ±7 per cent. It is probable that the estimates for high fertilizer-consuming States are equally accurate. On the other hand it is evident from the data presented that in States that only recently began the use of fertilizer (see Fig. 2, Minnesota, Iowa, Nebraska) the estimates may be considerably under the actual consumption.

The forecast of nitrogen, phosphoric acid, and potash tonnages assumes that all of these materials are freely available and that their prices do not change materially. If shortages occur in one or the other of these, farmers will buy additional quantities of the more abundant material. The magnitude of such substitutions should be limited by such shifts as can be made in fertilizers in keeping with sound agronomic practice.

We may assume that in 1945 farmers would be financially able and willing to make the same expenditure for fertilizers as in 1944, if 1944 income is about the same as in 1943. At present there is no way of knowing what 1944 farm income will be, but the Government has stabilized fertilizer prices at present levels. Therefore, the 1945 demand may be forecast from an assumed farm income or a more accurate forecast may be readily calculated from data in this paper as soon as the 1944 farm cash income is known.

(Continued on page 24)

Humus "Carries the Ball" for Fertilizer

By GEORGE SERVISS

THE MIRACLES of modern chemistry have so intrigued the public that many people feel that successful modern farming rests upon test tubes, various colored testing solutions, and chemical fertilizers. Chemical fertilizers are important; in fact, in the Northeast they are essential for high production on most soils. The test tubes and the testing solutions are also important, but they will not solve all production problems.

Chemicals alone, though, are not enough for a successful, permanent agriculture. Attention must be given to other things and one of the most important is organic matter. Failure to replenish organic matter as a result of economic pressure on one hand and too great faith in chemical fertilizers as "cure alls" on the other, has already resulted in declining yields on some soils. This has provided some "thunder" for an organic matter "cult," the members of which would dispense with the use of chemical fertilizers and rely entirely on organic residues and manures for maintaining soil fertility. This, any one at all versed in Soil Science will tell you, would have serious consequences for a consuming population of 140 million people a few years hence even if farmers' pocket-books could stand it.

Organic matter is not added to soils just for the sake of storing it up. It is put there to use. There is no reason why it should not be used. It accumulates under sod and decreases with cultivation. The thing to do is to adopt practices that will maintain soil organic matter at a satisfactory level. Nor is there any definite percentage that must be maintained in all soils; some soils need a higher organic matter content than others. The important thing, with most intensively cultivated soils, is to halt the downward trend in organic matter content. On many soils that have been badly depleted through serious erosion or complete neglect of organic matter replenishment, steps must be taken to rebuild the organic matter content to restore their original productivity.

*Reprinted from "American Agriculturist."

Soil organic matter is important for several reasons. It promotes granulation and thus improves soil structure. It increases pore space and consequently improves aeration and water penetration. Last, but by no means least, it serves as a storehouse for plant food and as a source of food and energy for the vital soil bacteria. To sum it all up simply; it improves both soil tilth and fertility.

The matter of granulation and structure is very important in heavy soils such as clays, clay loams, and silty clay loams. These soils are richer in plant nutrients than lighter soils, but they must be carefully managed to be productive. Organic matter binds the minute clay particles into granules which might be considered as building blocks. When a well granulated soil is plowed and worked it breaks apart, but the granules or blocks hold together. A farmer usually employs the term "mellow" to describe such a soil. A heavy soil that is not well granulated is difficult to plow. It breaks up into hard clods which make seedbed preparation slow and laborious. "Crusts" form following rains with a result that seeding failures are common. Well granulated heavy soils can be worked at higher moisture contents without puddling than those not well granulated and can be plowed with less difficulty at low moisture contents. Hard crusts that interfere with seedling emergence seldom form.

With light, sandy soils the story is a little different. The particles are so coarse that they do not form granules to any appreciable extent. With these soils, it is a question of adding "body"; of making a sand more like a loam.

Next is the matter of increased pore space with its effect on aeration and water penetration. Lack of aeration retards biological activities and plant growth. Slow water penetration reduces the amount of water falling in any given rain that is stored in the soil for use by plants. Slow penetration means increased runoff and increased evaporation before the water gets into the soil. This is especially important during the summer

months when much of the rain falls in short, hard thunder showers.

The matter of plant food is vital. Organic matter is a storehouse of plant food and of primary importance is its nitrogen content. The phosphorus content of a soil can be built up by the addition of phosphatic fertilizers, as phosphorus is lost very sparingly by leaching. Nitrogen, on the other hand, leaches readily after it is once in the nitrate form. Irrespective of what commercial fertilizer is used as a source, the nitrogen in it is likely to be quickly transformed to the nitrate form whenever soil temperatures are high enough to permit normal plant growth. A reserve soil supply can be built up only by increasing the organic matter additions. Other things being equal, the nitrogen content of a mineral soil is a very good measure of its productive capacity.

Feeds Useful Bacteria

The soil is not a sterile thing, it is literally alive. A piece as large as a fair sized marble may contain a billion or more live micro-organisms. Many vital processes are dependent on the presence of these organisms. They speed the decay of organic matter, thus liberating plant nutrients; they fix nitrogen from the air; and by their action many unavailable forms of plant food are changed to available forms. These processes and many others in which the soil organisms play a vital part require energy. The soil organic matter is the main source of this food and energy.

The organic matter content of most virgin soils declines rapidly during the first few years of cultivation. After several years of cultivation, the organic matter content of a soil will have declined to a point where it is not only practical but necessary to stabilize it. If it declines beyond this point productivity will also decline. The organic matter content of most northeastern soils has already declined to or past this point, so that organic matter replenishment is now essential.

WFA Names Howard B. Boyd as Director of Price

Elevation of Howard B. Boyd to be director of the Office of Price is announced by the War Food Administration. Mr. Boyd has been deputy director of price since February 8th, shortly after the office was created.

The new director of price has been in the Department of Agriculture for more than ten years. His first appointment was with the Agricultural Adjustment Administration in 1933 in which he worked primarily on the direction of commodity programs and programs in the insular region of the AAA. In May 1942 he was appointed vice-president of the Commodity Credit Corporation supervising foreign purchase work and subsidy programs. Later he successively became assistant director of the Office of Agricultural War Relations, also serving as secretary of the food advisory committee; assistant to the associate administrator of the War Food Administration; and deputy director of production.

The establishment of the Office of Price which Mr. Boyd now heads was announced by the War Food Administrator on January 22, 1944. The announcement stated that the Office of Price would have supervision over all functions of the War Food Administration relating to approval of maximum prices to be fixed for agricultural commodities or products, and relating to price-support programs in connection with particular commodities. At that time Ashley Sellers, assistant administrator of the War Food Administration, was named to act temporarily also as director of price.

February Sulphate of Ammonia

Production of by-product sulphate of ammonia during February amounted to 64,556 tons, according to the figures of the U. S. Bureau of Mines. This is a drop of 4.9 per cent from January, but actually the average daily production increased slightly over 1 per cent. Shipments showed an even greater decline, dropping below the production figuers but stocks on hand are still at the relatively low level of 25,533 tons.

Ammonia liquor production followed the same trend as sulphate of ammonia, showing a slight decrease of 144 tons (NH_3 content). In production and shipments, this material fluctuates less than its companion material. Supplies on hand at the end of the month amounted to only about 10 days' production.

	Sulphate of Ammonia Tons	Ammonia Liquor Tons NH_3
Production		
February, 1944	64,556	2,599
January, 1944	67,875	2,743
February, 1943	59,131	2,591
Shipments		
February, 1944	63,861	2,733
January, 1944	71,010	2,963
February, 1943	66,821	2,834
Stocks on Hand		
February, 1944	25,533	822
January, 1944	25,045	865
February, 1943	32,728	1,080
January, 1943	40,592	1,201

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Conserving Agricultural Bags

The supply of textile and paper bags is expected by the War Food Administration to meet the essential 1944 requirements of agriculture and food processing provided farmers and processors continue to use them conservatively.

Over-all supplies of textile and paper bagging fabrics, however, are not expected to meet all requirements for 1944. Farmers and food processors can maintain the relatively favorable supply situation for these materials only by using whatever substitute containers may be available, and by conserving and reusing bags now held in commercial and agricultural channels. Conservation measures now in effect prohibit the destruction of usable textile bags.

The total bag supply for 1944 is expected to be about the same as for 1943. Officials forecast less cotton bagging materials this year than last; however, the supply of burlap is expected to increase sufficiently to offset the reduction in the manufacture of cotton bagging. Farmers can help in several ways, officials say, to make the supply of bags meet the increasing demand:

1. *Handle bags properly to prolong their usefulness.* Bags should be opened by pulling the chain stitch; this avoids damage that occurs when bags are cut open with a knife. Bags should be shaken free of all contents, cleaned and repaired as soon as possible. They should be handled in such a way as to prevent mutilation through ripping and tearing.

2. *Store them where they will not be destroyed.* Proper storage on the farm will do much to keep available bags in use. Bags should be stored in a dry place, preferably hanging over a wire away from a wall or ceiling where they cannot be reached by rats or mice. They should not be piled up on cement floors, or where grease and dirt can accumulate. They should be free of all contents before storage, so that the fabric does not become caked or rotted.

3. *Get them back into circulation for re-use.* In many areas used bags can be returned to trade channels by sale to second-hand bag dealers, or through "bag exchanges" operated in cooperation with bag dealers, feed stores, country elevators, and other local business establishments. Through such arrangements, many farmers have been able to dispose of surplus bags so that other farmers could obtain them. WFA encourages continuance of this activity to keep bags moving into the trade and into farm areas.

Jones Stresses Need for Victory Gardens

Seed sales to victory gardeners are running about 30 per cent ahead of a year ago, Judge Marvin Jones, War Food Administrator, has announced.

Speaking before a meeting of the National Victory Garden Institute at Detroit, Judge Jones stressed the need for more and better gardens in 1944.

"We must not assume that the job is done merely because people are buying seed early," he said.

"Part of the increase in seed sales in January and early February is due to early buying. We hope, though, that it also means more gardens will be planted. Seed dealers in all parts of the country who were queried by the Bureau of Agricultural Economics in mid-February reported that their orders were about 30 per cent greater in number, over the same period in 1943, and that the orders have averaged somewhat larger.

"The victory gardens are increasingly important in our wartime food program. In 1942, 15 million victory gardens were planted. In 1943, we asked for 18 million. There were 20 million. They produced about 8 million tons of food—nearly 40 per cent of all vegetables grown for fresh consumption in the United States. Using products from victory gardens or commercial markets, American families canned some 4 billion jars of food last year, according to a report from the American Institute of Public Opinion.

"This great achievement in home food production and preservation did not in the least interfere with the output of commercial growers and canners. The whole record simply emphasizes the necessity for all-out production of food by everyone who has the opportunity. 'Grow More in '44', is the watchword. This year's victory garden goal is 22 million gardens and 10 million tons of food.

"That places a very sobering responsibility on every victory gardener. We can take no chances with any part of our food supply—and we certainly cannot afford to relax for one instant the Nation's fullest attention to this great share of our total food supply.

"The fact that we now have an adequate supply of most processed vegetables is due very largely to victory garden production. The consuming public this winter is receiving the benefit. Whether we may hope for similar good fortune next winter will, of course, depend in a large part on how the Nation repeats the victory garden effort in 1944. It will not depend on what has been done. If we leave it to the other fellow to grow food this year, the supply of processed vegetables this time next year will not be so satisfactory.

"We cannot rely on the commercial growers for the extra food we will need this year. They worked at nearly full capacity last year. Our goals committee recognized this in the goals for this year, and asked for only a small increase in acreage from commercial growers. The rest of the burden falls on victory gardeners.

"The splendid cooperation in victory gardens by private groups with the Government and State agencies broke all home food production records in 1943. Among these private groups industrial and business concerns have encouraged company-employe gardens and other garden activities. The National Victory Garden Institute is doing an important and necessary service in the national food effort.

"The production of food from the victory garden is not its only value. Victory gardens save transportation; they save containers; they save manpower in many ways. All these are critical. If all the savings and advantages which victory gardens produce could be fully realized, I believe that the effort would be still further increased. In total, all these savings make it imperative that no victory gardener relax his effort this year, but rather increase it, so that the goal of 22,000,000 gardens, with increased production per garden, will be realized."

Copper Sulphate Group Formed by OPA

The formation of a copper sulphate standing subcommittee has been announced by the Office of Price Administration. As a unit of the industry advisory committee concerned with all agricultural insecticides and fungicides, this subcommittee will represent the interests of eight refineries and manufacturers, 500 wholesalers and 10,000 retailers of copper sulphate and copper lime dusts. It will act in a consulting capacity with OPA on matters pertaining to the pricing of copper sulphate. The members of this new subcommittee, representing large and small firms throughout the entire United States, are:

George Paterson, of the Irvington Smelting & Refining Company, Irvington, N. J.; Edwin J. Mayer, of the Superior Copper Products Company, Chicago; M. M. Stock-

man, of the Mountain Copper Company, San Francisco, Calif.; W. C. Bennett, of the Phelps-Dodge Refining Corporation, New York; Leon David, of the Brooklyne Chemical Works, Baltimore, Md., and Fred B. Porter, of the Tennessee Corporation, Atlanta, Ga.

March Tax Tag Sales

Fertilizer tax tag sales in March were somewhat below March, 1943. This decline, and the one which occurred in February, reflect the earlier buying of fertilizer. In the nine months from July through March, sales this year exceeded the corresponding period of last year by 874,000 tons, or 17 per cent. Sales each month from July through January were well above the preceding year, as shown by the table below.

The prewar seasonal movement of sales, culminating in a peak in March, is illustrated by the 1939–40 figures. By 1942–43, farmers were buying their fertilizer earlier in the season than formerly, and further progress in early buying was made this year.

Sales have made a better showing, relative to last year, in the Midwest than they have in the South.

MONTHLY TAG SALES (Thousands of Tons)

	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1943–44	158	266	310	368	463	718	1,244	1,300	1,334	....	...	...
1942–43	84	212	231	222	250	357	1,090	1,469	1,371	884	448	130
1939–40	52	154	222	210	110	190	459	718	1,640	1,183	406	149

FERTILIZER TAX TAG SALES

State	March				January-March		
	1944	1943	1942	%	1944	1943	1942
	Tons	Tons	Tons	1943	Tons	Tons	Tons
Virginia	74,463	90,541	69,852	101	216,862	215,235	226,370
North Carolina	260,970	258,906	184,951	98	758,540	777,289	813,807
South Carolina	171,675	184,537	143,014	89	487,028	547,747	472,739
Georgia	261,341	289,963	243,953	96	669,899	698,176	561,745
Florida	81,930	66,690	50,460	114	278,772	244,160	211,177
Alabama	161,600	164,250	163,600	98	469,250	481,000	416,650
Mississippi	74,199	69,129	55,525	99	239,594	240,936	194,440
Tennessee	44,625	43,415	35,771	113	112,310	99,766	79,350
Arkansas	16,775	37,760	29,750	65	71,933	110,550	100,000
Louisiana	45,250	39,100	44,489	102	110,400	107,913	100,436
Texas	32,440	36,475	39,453	102	90,965	89,180	84,033
Oklahoma	2,112	2,721	2,255	85	10,371	12,171	5,805
Total South	1,227,380	1,283,487	1,063,073	97	3,515,924	3,624,123	3,266,552
Indiana	33,275	34,450	35,018	79	123,230	156,800	182,586
Illinois	18,600	12,542	18,103	136	63,550	46,722	40,293
Kentucky	39,173	31,963	26,940	161	103,549	64,378	65,721
Missouri	13,243	8,222	18,048	162	60,189	37,074	28,396
Kansas	2,685	696	614	593	11,856	1,999	919
Total Midwest	106,976	87,873	98,723	118	362,374	306,973	317,915
Grand Total	1,334,356	1,371,360	1,161,796	99	3,878,298	3,931,096	3,584,467

FERTILIZER MATERIALS MARKET

NEW YORK

All Ammonium Sulphate Taken as Allocated. Buyers Eager for Prompt Potash Deliveries. Labor Shortage Handicaps Superphosphate and Phosphate Rock Production. Cottonseed Allocation for Fertilizer About Completed.

Exclusive Correspondence to "The American Fertilizer"

NEW YORK, April 5, 1944.

Sulphate of Ammonia

While production has been favorable, there has been no accumulation of stocks as demand from fertilizer manufacturers has continued active and, in most cases, all material allocated is being taken.

Nitrate of Soda

Deliveries of this material continue with sufficient supplies on hand to take care of material allocated.

Potash

Demand continues and most buyers are pressing to have their shipments rushed as much as possible, as they are anxious to get the material allocated for the third period into their plants in time for use during the present fertilizer season. Buyers are now especially interested in quantities which will be available for them during the new season and are hopeful that allocations will be a trifle larger than last year.

Superphosphate

Production continues but many of the larger manufacturers have not been able to produce up to capacity due to labor shortage. In many instances where sulphuric acid has been available to them, they have been unable to accept delivery due to this labor shortage. It is expected that the superphosphate situation may be helped somewhat during the next few months as some additional triple superphosphate is being made available to buyers.

Phosphate Rock

Buyers are taking deliveries as quickly as material is available but here again the labor situation is hampering production to some extent.

Cottonseed Meal

By the allocation of the imported cottonseed meal for the New England area, the demand for this material for use for tobacco growers has been about met, and it is expected that imports will soon again be allocated entirely for the feeding trade.

BALTIMORE

Labor Shortage Prevents Larger Shipments of Spring Fertilizers. Feed Market Absorbing Almost All Organic Material.

Exclusive Correspondence to "The American Fertilizer"

BALTIMORE, April 4, 1944.

The labor situation is causing considerable concern on the part of fertilizer manufacturers in this section, as they have fertilizer ready and orders in hand, but it is a question of manpower to get shipments out. There is no easing up in the situation, and it is beginning to look as though this condition may have a tendency either to curtail or hold down the tonnage which otherwise would be shipped this spring.

Ammoniates.—There is no change in the situation as far as organic ammoniates are concerned. Tankage and blood are still scarce and practically unobtainable for fertilizer purposes, and the recent ruling of the Government permitting 80 per cent of organics instead of only 70 per cent only offers relief in securing other than packing house by-products.

Castor Meal.—The situation on this article also continues tight with manufacturers not taking on any new or additional business.

Fish Scrap.—It will be several months before Chesapeake Bay fisheries will resume work, but their output will probably be absorbed by the feeding trade rather than for fertilizer purposes.

Sulphate of Ammonia.—There is no change in the situation; manufacturers are still taking deliveries under allocation.

Nitrate of Soda.—There is no change in the market and deliveries likewise are being allocated for top dressing as well as mixing purposes.

Superphosphate.—None of the producers have been able to accumulate any surplus and it is next to impossible to secure any outside supplies, as there are no resales on the market at ceiling price of 64 cents per unit of A. P. A. for run-of-pile. With increased cost of rock production as well as increased cost of manufacture of superphosphate, the margin of profit in the latter is comparatively small.

Potash.—Deliveries continue to be made under contracts previously booked, and it would appear that all manufacturers will have sufficient tonnage to take care of their legitimate manufacturing requirements.

Bone Meal.—There is no change in the situation and both raw and steamed bone meal are practically off the market. There is only a light demand in view of the comparatively high cost of bone meal on a comparative plant food basis.

Bags.—With cotton cloth almost unobtainable for fertilizer bags and a paper shortage, it would appear that sooner or later burlap bags will again be permitted for fertilizer purposes. By the time the fall season opens up some of the manufacturers anticipate going back to using burlap bags which are in many cases desired by the farm consuming trade on account of their being able to re-use the bags for many of their crops.

CHARLESTON

Practically No Organics Available for Fertilizer. Almost All Materials in Short Supply.

Exclusive Correspondence to "The Vzerican Fertilizer"

CHARLESTON, April 3, 1944.

Organics.—There has been no improvement in this situation, and quite a few of the fertilizer manufacturers have been compelled to put out 100 per cent mineral goods.

Superphosphate.—Ordinary superphosphate remains fairly scarce, and there has been no improvement in the supply of triple, as Lend-Lease continues to draw heavily on this.

Blood.—The present market is $5.53 per unit of ammonia ($6.72 per unit N) f. o. b. Chicago, Ill. There is an exceedingly limited supply.

Hoof Meal.—This material is priced at $4.25 to $4.50 per unit of ammonia ($5.16½ to $5.47 per unit N) f. o. b. Chicago, but it is scarce.

CHICAGO

Little Fertilizer Organic Material Obtainable Even Though Its Use Is Permitted. Feed Demand Still Exceeds Supply.

Exclusive Correspondence to "The American Fertilizer"

CHICAGO, April 3, 1944.

But little can be said regarding the market in organics. Demand keeps prices at the ceiling, while offerings are few and far between. F. P. O. 12, Revision permitting the use of 80 per cent organic material instead of 70 per cent, could be of considerab leassistance if the organic was obtainable.

Small quantities of wet rendered tankage and blood have recently sold at full ceiling prices of $5.53 per unit ammonia ($6.72 per unit N), f. o. b. producing points. The demand, however, still exceeds supply.

Ceilings are well maintained:

High grade ground fertilizer tankage, $3.85 to $4.00 ($4.68 to $4.86 per unit N) and 10 cents; standard grades crushed feeding tankage, $5.53 per unit ammonia ($6.72 per unit N); blood, $5.38 ($6.54 per unit N); dry rendered tankage, $1.21 per unit of protein, Chicago basis.

TENNESSEE PHOSPHATE

Shipments of All Grades Continuing at Peak Levels. Benefit Payments for 1944 Announced.

Exclusive Correspondence to "The American Fertilizer"

COLUMBIA, TENN., April 3, 1944.

Shipments of all grades of finished product into all consuming channels with movement of raw material to electric furnace plants in Columbia, Mt. Pleasant and Muscle Shoals continue as actively as ever and such a thing as a prominent stock pile is unknown at any of the plants. Farmers through the corn belt wanting to get phosphate spread ahead of oats and clover seeding and seed bed preparation on corn and other land, have made the wires hot and the mail heavy, but all the producers of ground rock can do is to ship all that insufficient manpower can get loaded and make the best selective job of distribution in their power, with no chance on earth of satisfying all customers. It is fortunate, however, that all farmers are learning the fact that they can spread ground phosphate rock any time of the year they can get it, unlike soluble and chemically active fertilizer which of necessity has only two seasons.

In consequence, the past two years have witnessed an almost complete filling up of the two great valleys of poor business that used to be in evidence during May to July and November to February. Now the shippers in that line have a headache all the year round, but somewhat aggravated in March, April, August and September.

There were no bids on Government requirements for AAA distribution for 1944 from Tennessee as producers here are all filled up with orders from farmers direct. The only rock AAA is supplying into Illinois and Kentucky, where they make grants of aid, coming from Florida.

Benefit payments provided by AAA for farmer use of phosphate rock in 1944 program are confined to fourteen states, ranging from $5.00 per ton in Florida, $10.00 in Delaware, Maryland, North Carolina and Tennessee, $11.00 in Indiana and Oklahoma, $12.00 in Illinois, Iowa and Ohio, $13.00 in Missouri, Wisconsin and Michigan, $14.00 in Kentucky and $15.00 in Minnesota and South Dakota. Allowance of from 5 cents to 8 cents per pound of available phosphoric acid that may be shown by AOAC test for superphosphate is allowed in the Virginias, New Mexico, Oregon and Utah, while the remaining twenty-eight states allow nothing on rock.

Work has started on the TVA project for defluorinating or fusing phosphate rock in a vertical furnace for stockfood at Godwin but whether it can be completed this year is not yet known. What method of distribution will be adopted is not yet announced.

Fertilizer Prospects for North Carolina

"The present prospect is that during the year ending June, 1944, more fertilizer will be produced, distributed, and used on the farms of North Carolina than during any previous year," D. S. Coltrane, assistant to the Commissioner of Agriculture of North Carolina, said recently in discussing the fertilizer outlook for this year.

Nitrogen

Coltrane pointed out that in 1942–43 the farmers of that State used approximately 51,357 tons of nitrogen, 20,230 tons of this amount being used as side- or top-dressing and 31,127 in mixed fertilizers.

"If we get the 35 per cent increase which it now appears is available, it will give us a total of 69,332 tons of actual nitrogen. If this is allotted for mixing and side-dressing, we should have 30,000 tons of nitrogen for top-dressing and 39,332 tons for mixed fertilizers,"

declared Coltrane. He added that "present indications are that agriculture will have four tons of nitrogen for every three tons used last year."

Organic Nitrogen

According to Coltrane, the supply of organic nitrogen is about 70 per cent of that of last season—with allocations to manufacturers being made on this basis. Coltrane said that the supply this year will run from 22,000 to 24,000 tons as compared with around 35,000 tons in normal years.

"The demand for feed is so great and so important that nearly all materials that can be so used will be directed into feed channels."

The water insoluble nitrogen guarantees in mixed fertilizers will be reduced as follows: tobacco fertilizer, 20 to 25 per cent of the total; general crop fertilizer, five or ten per cent of total; and in many cases fertilizers will be 100 per cent water insoluble.

Superphosphate

"Production of superphosphate has been increasing steadily month by month in existing plants, and some standby plants have been reopened, with construction of some new plants authorized. The present rate of production indicates a total output of over 6,500,000 tons, as against 5,144,484 in 1942," declared Mr. Coltrane.

Potash

"With an increased tonnage of mixed fertilizer to be manufactured this year, it is expected that the potash content of North Carolina fertilizers will average from five to 5.50 per cent," said Coltrane. He explained that American production of potash salts is at a rate of approximately 700,000 tons per year—the largest tonnage ever made available for American industries. However, increased requirements of chemicals for direct war use and Lend-Lease commitments will leave around 540,000 tons, or about 93 per cent of the average tonnage used each year during the past two years.

General Situation

There are abundant supplies of nitrogen and superphosphate, more than ever before, but there is a smaller amount of potash.

"We believe that our farmers should be encouraged to use the higher nitrogen grades; otherwise, we may not utilize all the nitrogen that will be available. Our mixed fertilizer only averaged 2.96 per cent nitrogen last year, and the consensus of our agronomists is that for many crops, especially grain, our farmers do not use a sufficient amount of nitrogen," asserted Coltrane.

Native Sulphur in February, 1944

If present trends continue, new high levels of consumption of native sulphur will be attained in 1944 according to figures released by the Bureau of Mines, United States Department of the Interior. In the first two months of the year, mine shipments were 36 per cent greater than in the same period of 1943, whereas production was 15 per cent lower. Stock reduction, which has averaged 68,000 tons monthly during the past year, totaled 57,581 tons in February.

PRODUCTION, MINE SHIPMENTS AND PRODUCERS' STOCKS OF NATIVE SULPHUR IN THE UNITED STATES IN SELECTED PERIODS 1943–44, IN LONG TONS

Period	Production	Mine Shipments	Producers' Stocks*
January, 1944...	179,226	253,190	4,360,018
February, 1944..	186,568	251,260	4,302,437
January, 1943...	231,086	171,755	5,148,206
February, 1943..	200,802	199,893	5,123,114
Jan.-Feb., 1944..	365,794	504,450	4,302,437
Jan.-Feb., 1943..	431,888	371,648	5,123,114

*Producers' stocks at mines, in transit, and in warehouses at end of period.

J. Albert Woods Honored by Chilean Government

The rank of Comendador, Chilean Order of Merit, was recently conferred on J. Albert Woods, president of the Chilean Nitrate Sales Corporation, by the Chilean Government. A banquet given in his honor by the Chilean Nitrate and Iodine Sales Corporation, in Santiago, was attended by ministers of State, high dignitaries, and officials of the Government, industry, and commerce. Mr. Woods has been in Chile on a business trip for several weeks, and is expected to return to New York in the near future.

See Page 4

RELATIONSHIP BETWEEN FARM INCOME AND EXPENDITURES FOR FERTILIZERS

(Continued from page 11)

Literature Cited

(1) Brodell, A. P. and Cooper, M. R. Some factors affecting fertilizer consumption. Bur. Agr. Ec. Mimeo. Rept. F. M. 10. 29 pp (1940).

(2) Kriesel, H. C. Farmers' expenditures for fertilizer and agricultural lime 1909–39. Bur. Agr. Ec. Mimeo. Rept. 16 pp (1940).

(3) Mehring, A. L. and Deming, Lola S. The extent to which chemical research has lowered the costs of fertilizers to consumers since 1880. American Fertilizer 85: No. 9, 9–11 (1936).

(4) ——— ——— Average plant-food content of fertilizers consumed in the U. S. and its subdivisions, 1934–1939. American Fertilizer 93: No. 4, 5–11, 22, 24 and 26 (1940).

(5) Vial, E. E. Prices of fertilizer materials, and factors affecting the fertilizer tonnage. Memoir 119, Cornell Univ. Agr. Expt. Sta. 159 pp (1928).

(6) Willett, H. Fertilizer consumption in the U. S. National Fert. Assn. 8 pp (1937).

(See Page 27 for Table VI)

TABLE VII

ESTIMATED COMMERCIAL DEMAND FOR PLANT-FOOD IN 1944 BY STATES

State	N tons	P_2O_5 tons	K_2O tons
Maine	13,795	25,897	30,279
New Hampshire	888	1,719	1,290
Vermont	859	2,509	1,671
Massachusetts	5,274	8,329	6,259
Rhode Island	875	1,805	1,168
Connecticut	3,370	4,774	3,962
New England	25,061	45,033	44,629
New York	17,926	77,434	25,057
New Jersey	13,264	27,196	22,308
Pennsylvania	12,997	70,163	27,485
Delaware	2,893	8,897	7,264
Maryland & D. C.	8,874	28,172	18,346
West Virginia	2,361	11,760	3,940
Mid Atlantic	58,315	223,622	104,400
Virginia	26,701	65,259	30,523
North Carolina	80,502	138,010	85,257
South Carolina	59,654	72,152	54,927
Georgia	71,821	109,865	63,885
Florida	62,996	84,867	82,744
So. Atlantic	301,674	470,153	317,336
Ohio	15,335	80,650	39,116
Indiana	9,527	64,254	42,708
Illinois	3,144	13,165	8,056
Michigan	6,466	32,509	18,630
Wisconsin	3,116	18,400	12,565
E. No. Central	37,588	208,978	121,075
Minnesota	789	6,271	3,003
Iowa	555	4,368	2,011
Missouri	2,165	22,150	4,104
North Dakota	39	1,639	39
South Dakota	6	342	3
Nebraska	26	1,627	26
Kansas	329	7,489	329
W. No. Central	3,909	43,886	9,515
Kentucky	4,134	29,630	6,630
Tennessee	7,342	27,080	8,878
Alabama	73,353	94,540	47,905
Mississippi	57,484	28,207	17,190
Arkansas	11,045	7,500	6,632
Louisiana	21,367	17,941	8,184
Oklahoma	283	734	325
Texas	11,835	23,232	8,328
So. Central	186,843	228,864	104,072
Montana	135	4,374	101
Idaho	6	5,773	10
Wyoming	0	1,477	0
Colorado	508	3,177	310
New Mexico	149	1,717	13
Arizona	1,526	2,582	54
Utah	58	2,331	26
Nevada	18	325	18
Washington	4,236	8,631	3,651
Oregon	4,076	5,288	2,669
California	67,484	37,996	14,029
Western	78,196	73,671	20,881
United States	691,586	1,294,207	721,907

TABLE IV

RELATIONSHIP BETWEEN FARMER'S AVERAGE EXPENDITURE FOR FERTILIZER AND PREVIOUS YEAR'S CASH INCOME FOR THE YEARS 1935 TO 1939, BY STATES AND REGIONS

State	Average Fertilizer Tonnage 1935–1939	State Retail Price per Ton Index (U. S. = 100) *	Average Expenditure for Fertilizer 1935–1939 **	Average Cash Income 1934–1938	Average Expenditure for Fertilizer per Dollar of Previous Year's Cash Income
	tons		$1,000	$1,000	cents
Maine	139,200	140	5,800	51,388	11.
New Hampshire	13,800	127	530	21,472	2.4
Vermont	17,941	122	660	36,801	1.8
Massachusetts	67,022	116	2,300	71,706	3.2
Rhode Island	10,840	119	390	9,239	4.2
Connecticut	57,324	122	2,100	52,084	4.0
New England	306,127	129	11,800	242,690	4.9
New York	297,374	105	9,400	296,653	3.2
New Jersey	167,389	105	5,300	95,372	5.5
Pennsylvania	339,186	99	10,000	256,514	3.9
Delaware	38,609	93	1,100	22,095	4.9
Maryland & D. C.	170,559	99	5,100	67,901	7.5
West Virginia	52,600	100	1,600	39,891	4.0
Mid Atlantic	1,065,717	101	32,500	778,426	4.2
Virginia	405,742	91	11,000	119,569	9.2
North Carolina	1,119,246	90	30,000	242,900	12.
South Carolina	670,205	89	18,000	107,588	17.
Georgia	725,287	91	20,000	160,444	12.
Florida	524,494	114	18,000	113,133	16.
South Atlantic	3,444,974	94	97,000	743,634	13.
Ohio	335,134	103	10,000	320,621	3.2
Indiana	217,951	105	6,900	263,787	2.6
Illinois	33,962	110	1,100	466,666	0.24
Michigan	131,799	113	4,500	214,329	2.1
Wisconsin	38,505	115	1,300	291,778	0.45
E. No. Central	757,351	109	23,800	1,557,181	1.5
Minnesota	12,059	133	480	321,740	0.15
Iowa	8,818	116	310	537,561	0.057
Missouri	74,704	110	2,500	252,490	0.98
North Dakota	750	120	27	106,104	0.025
South Dakota	160	150	7	101,874	0.007
Nebraska	1,177	173	61	255,130	0.024
Kansas	13,240	140	560	283,693	0.20
W. No. Central	110,908	117	3,940	1,858,592	0.21
Kentucky	101,990	117	3,600	148,363	2.4
Tennessee	122,744	92	3,400	130,586	2.6
Alabama	522,062	96	15,000	129,018	12.
Mississippi	284,592	103	8,800	167,136	5.3
Arkansas	59,832	94	1,700	145,733	1.2
Louisiana	135,197	107	4,300	122,036	3.5
Oklahoma	7,029	110	230	178,557	0.13
Texas	79,250	118	2,800	527,956	0.53
South Central	1,312,696	101	39,800	1,549,385	2.6
Montana	4,154	175	220	90,844	0.24
Idaho	5,186	170	260	93,757	0.28
Wyoming	1,522	173	79	44,300	0.18
Colorado	2,695	175	140	124,518	0.11
New Mexico	2,112	150	95	47,024	0.20
Arizona	6,278	130	240	50,154	0.48
Utah	1,890	172	97	42,163	0.23
Nevada	500	119	18	11,787	0.15
Washington	23,110	138	960	147,583	0.65
Oregon	15,300	154	710	104,543	0.68
California	209,029	148	9,300	609,144	1.5
Western	271,776	148	12,100	1,365,817	0.89
United States	7,269,549	...	221,000	8,095,725	2.7

*Calculated from available prices, principally from 1934 prices which were available for each State (3). Account was taken of kinds of mixtures and materials bought and the total plant-food content of the average ton of fertilizer.

**Tonnage $\times \frac{\text{State price index}}{100} \times \$30$. U. S. average price per ton for the period 1935 to 1939, Table I, was $30.12.

TABLE VI

PLANT-FOOD PURCHASED IN CONTINENTAL UNITED STATES DURING 1939, 1940, 1941 IN RELATION TO PREVIOUS YEAR'S CASH INCOME

State	Plant-food purchased Average 1939–1941			Total cash income Average	Pounds of plant-food purchased per dollar of previous year's cash income			
	N	P_2O_5	K_2O	1938–1940	N	P_2O_5	K_2O	Total Plant-food
	tons	tons	tons	$1,000				
Maine	8,294	15,572	18,205	52,726	.3146	.5906	.6905	1.5957
New Hampshire	720	1,391	1,045	22,508	.0639	.1236	.0928	0.2803
Vermont	610	1,780	1,186	40,836	.0298	.0871	.0580	0.1749
Massachusetts	3,658	5,776	4,340	76,328	.0958	.1513	.1137	0.3608
Rhode Island	607	1,251	810	9,840	.1233	.2542	.1646	0.5421
Connecticut	3,362	4,765	3,955	55,706	.1207	.1710	.1419	0.4336
New England	17,251	30,535	29,541	257,944	.1337	.2367	.2290	0.5994
New York	11,589	50,029	16,187	317,681	.0729	.3149	.1019	0.4897
New Jersey	8,185	16,777	13,751	101,695	.1609	.3299	.2706	0.7614
Pennsylvania	8,677	46,798	18,335	268,798	.0645	.3482	.1364	0.5491
Delaware	1,122	3,448	2,816	21,898	.1024	.3149	.2571	0.6744
Maryland & D. C.	5,476	17,373	11,316	71,490	.1531	.4860	.3165	0.9556
West Virginia	1,481	7,379	2,473	42,073	.0704	.3507	.1175	0.5386
Mid Atlantic	36,530	141,804	64,878	823,635	.0887	.3443	.1575	0.5905
Virginia	15,685	38,335	17,931	124,380	.2522	.6164	.2883	1.1569
North Carolina	46,863	80,028	49,436	230,676	.4047	.6938	.4286	1.5271
South Carolina	38,534	46,606	35,477	112,267	.6864	.8302	.6320	2.1486
Georgia	39,833	60,928	35,433	160,924	.4950	.7572	.4403	1.6925
Florida	29,024	39,104	38,125	120,025	.4836	.6515	.6352	1.7703
South Atlantic	169,939	265,001	176,402	748,272	.4542	.7083	.4714	1.6339
Ohio	9,073	47,685	23,126	328,417	.0552	.2903	.1408	0.4863
Indiana	4,920	33,142	22,021	282,301	.0348	.2347	.1560	0.4255
Illinois	1,739	7,179	4,408	535,105	.0064	.0268	.0164	0.0496
Michigan	4,158	20,888	11,972	229,534	.0362	.1820	.1043	0.3225
Wisconsin	1,437	8,414	5,752	302,766	.0094	.0555	.0379	0.1028
E. No. Central	21,327	117,308	67,279	1,678,123	.0254	.1398	.0801	0.2453
Minnesota	398	3,131	1,511	374,035	.0021	.0167	.0080	0.0268
Iowa	278	2,061	950	652,320	.0008	.0063	.0029	0.0100
Missouri	1,072	10,929	2,025	277,274	.0077	.0788	.0146	0.1011
North Dakota	14	567	17	131,877	.0002	.0085	.0002	0.0089
South Dakota	3	180	2	125,158	.00005	.0029	.00003	0.0030
Nebraska	18	805	15	248,216	.0001	.0064	.0001	0.0066
Kansas	166	3,706	167	271,392	.0012	.0273	.0012	0.0297
W. No. Central	1,949	21,379	4,687	2,080,272	.0018	.0205	.0045	0.0268
Kentucky	2,192	15,696	3,516	159,225	.0275	.1971	.0441	0.2687
Tennessee	4,213	15,522	5,089	138,634	.0607	.2239	.0734	0.3580
Alabama	34,669	44,683	22,644	117,792	.5886	.7586	.3844	1.7316
Mississippi	31,995	15,700	9,569	160,937	.3976	.1951	.1189	0.7116
Arkansas	7,773	5,285	4,668	160,889	.0966	.0656	.0580	0.2202
Louisiana	13,372	11,226	5,123	125,328	.2133	.1791	.0817	0.4741
Oklahoma	206	519	236	196,888	.0020	.0052	.0023	0.0095
Texas	6,128	12,016	4,304	566,021	.0216	.0424	.0152	0.0792
South Central	100,548	120,647	55,149	1,625,714	.1236	.1484	.0678	0.3398
Montana	59	1,835	47	94,162	.0012	.0389	.0009	0.0410
Idaho	3	2,851	8	94,025	.00006	.0606	.0001	0.0608
Wyoming	0	875	0	50,273	0	.0348	0	0.0348
Colorado	230	1,430	145	132,613	.0034	.0215	.0021	0.0270
New Mexico	95	1,087	9	55,557	.0034	.0391	.0003	0.0428
Arizona	841	1,420	32	58,888	.0285	.0482	.0010	0.0777
Utah	27	1,059	14	47,372	.0011	.0447	.0005	0.0463
Nevada	10	175	10	12,989	.0015	.0269	.0015	0.0299
Washington	1,755	3,572	1,513	146,616	.0239	.0487	.0206	0.0932
Oregon	1,842	2,383	1,204	110,199	.0333	.0432	.0218	0.0983
California	31,750	17,880	6,605	610,742	.1039	.0585	.0216	0.1840
Western	36,612	34,567	9,587	1,413,436	.0518	.0489	.0135	0.1142
United States	384,156	731,241	407,523	8,627,396	.0890	.1695	.0944	0.3529

BUYERS' GUIDE • A CLASSIFIED INDEX TO ALL THE ADVERTISERS IN "THE AMERICAN FERTILIZER"

This list contains representative concerns in the Commercial Fertilizer Industry, including fertilizer manufacturers, machinery and equipment manufacturers, dealers in and manufacturers of commercial fertilizer materials and supplies, brokers, chemists, etc.
For Alphabetical List of Advertisers, see page 33.

ACID BRICK
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Chemical Construction Corp., New York City.

ACID EGGS
Chemical Construction Corp., New York City.

ACIDULATING UNITS
Chemical Construction Corp., New York City.
Sackett & Sons Co., The A. J., Baltimore, Md.

AMMO-PHOS
American Cyanamid Co., New York City.

AMMONIA—Anhydrous
Barrett Division, The, Allied Chemical & Dye Corp., New York City.
DuPont de Nemours & Co., E. I., Wilmington, Del.
Hydrocarbon Products Co., New York City.

AMMONIA LIQUOR
Barrett Division, The, Allied Chemical & Dye Corp., New York City.
DuPont de Nemours & Co., E. I., Wilmington, Del.
Hydrocarbon Products Co., New York City.

AMMONIA OXIDATION UNITS
Chemical Construction Corp., New York City.

AMMONIATING EQUIPMENT
Sackett & Sons Co., The A. J., Baltimore, Md.

AMMONIUM NITRATE SOLUTIONS
Barrett Division, The, Allied Chemical & Dye Corp., New York City.

AUTOMATIC ELEVATOR TAKEUPS
Sackett & Sons Co., The A. J., Baltimore, Md.

BABBITT
Sackett & Sons Co., The A. J., Baltimore, Md.

BAGS AND BAGGING—Manufacturers
Bagpak, Inc., New York City.
Bemis Bro. Bag Co., St. Louis, Mo.
St. Regis Paper Co., New York City.
Textile Bag Mfrs. Association, Chicago, Ill.
Union Bag & Paper Corporation, New York City.

BAGS—Cotton
Bemis Bro. Bag Co., St. Louis, Mo.
Textile Bag Mfrs. Association, Chicago, Ill.

BAGS—Paper
Bagpak, Inc., New York City
Bemis Bro. Bag Co., St. Louis, Mo.
St. Regis Paper Co., New York City.
Union Bag & Paper Corporation, New York City.

BAGS (Waterproof)—Manufacturers
Bemis Bro. Bag Co., St. Louis, Mo.
St. Regis Paper Co., New York City.
Textile Bag Mfrs. Association, Chicago, Ill,
Union Bag & Paper Corporation, New York City.

BAGS—Dealers and Brokers
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Huber & Company, New York City.
Jett, Joseph C., Norfolk, Va.
McIver & Son, Alex. M., Charleston, S. C.
Wellmann, William E., Baltimore, Md.

BAG CLOSING MACHINES
Bagpak Inc., New York City.
St. Regis Paper Co., New York City.

BAGGING MACHINES—For Filling Sacks
Atlanta Utility Works, East Point, Ga.
Bagpak, Inc., New York City.
St. Regis Paper Co., New York City.
Sackett & Sons Co., The A. J., Baltimore, Md.

BAG PILERS
Link-Belt Company, Philadelphia, Chicago.

BEARINGS
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.

BELT LACING
Sackett & Sons Co., The A. J., Baltimore, Md.

BELTING—Chain
Atlanta Utility Works, East Point, Ga.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

BELTING—Leather, Rubber, Canvas
Sackett & Sons Co., The A. J., Baltimore, Md.

BOILERS—Steam
Atlanta Utility Works, East Point, Ga.

BONE BLACK
American Agricultural Chemical Co., New York City
Armour Fertilizer Works, Atlanta, Ga.
Huber & Company, New York City.

BONE PRODUCTS
American Agricultural Chemical Co., New York City
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Huber & Company, New York City.
Jett, Joseph C., Norfolk, Va.
McIver & Son, Alex. M., Charleston, S. C.
Schmaltz, Jos. H., Chicago, Ill.
Wellmann, William E., Baltimore, Md.

BORAX AND BORIC ACID
American Potash and Chem. Corp., New York City.
Pacific Coast Borax Co., New York City.

BROKERS
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Dickerson Co., The, Philadelphia, Pa.
Huber & Company, New York City.
Jett, Joseph C., Norfolk, Va.
Keim, Samuel L., Philadelphia, Pa.
McIver & Son, Alex. M., Charleston, S. C.
Schmaltz, Jos. H., Chicago, Ill.
Wellmann, William E., Baltimore, Md.

BUCKETS—Elevator
Link-Belt Company, Philadelphia, Chicago
Sackett & Sons Co., The A. J., Baltimore, Md
Stedman's Foundry and Mach. Works, Aurora, Ind

A Classified Index to Advertisers in "The American Fertilizer"

BUYERS' GUIDE

For an Alphabetical List of all the Advertisers, see page 33

BUCKETS—For Hoists, Cranes, etc., Clam Shell, Orange Peel, Drag Line, Special; Electrically Operated and Multi Power
Hayward Company, The, New York City.
Link-Belt Company, Philadelphia, Chicago.

BURNERS—Sulphur
Chemical Construction Corp., New York City.

BURNERS—Oil
Monarch Mfg. Works, Inc., Philadelphia, Pa.
Sackett & Sons Co., The A. J., Baltimore, Md.

CABLEWAYS
Hayward Company, The, New York City.

CARBONATE OF AMMONIA
American Agricultural Chemical Co., New York City.
DuPont de Nemours & Co., E. I., Wilmington, Del.

CARS—For Moving Materials
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

CARTS—Fertilizer, Standard and Roller Bearing
Atlanta Utility Works, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.

CASTINGS—Acid Resisting
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Duriron Co., Inc., The, Dayton, Ohio.

CASTINGS—Iron and Steel
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

CEMENT—Acid-Proof
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Chemical Construction Corp., New York City.

CHAIN DRIVES—Silent
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

CHAINS AND SPROCKETS
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

CHAMBERS—Acid
Chemical Construction Corp., New York City
Fairlie, Andrew M., Atlanta, Ga.

CHEMICAL APPARATUS
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Duriron Co., Inc., The, Dayton, Ohio.
Monarch Mfg. Works, Inc., Philadelphia, Pa.

CHEMICALS
American Agricultural Chemical Co., New York City.
American Cyanamid Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Barrett Division, The, Allied Chemical & Dye Corp., New York City.
Bradley & Baker, New York City.
DuPont de Nemours & Co., E. I., Wilmington, Del.
Huber & Company, New York City.

CHEMICALS—Continued
International Minerals & Chemical Corporation, Chicago, Ill.
McIver & Son, Alex. M., Charleston, S. C.
Phosphate Mining Co., The, New York City.
Wellmann, William E., Baltimore, Md.

CHEMICAL PLANT CONSTRUCTION
Atlanta Utility Works, East Point, Ga.
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Chemical Construction Corp., New York City.
Fairlie, Andrew M., Atlanta, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

CHEMISTS AND ASSAYERS
Gascoyne & Co., Baltimore, Md.
Shuey & Company, Inc., Savannah, Ga.
Stillwell & Gladding, New York City.
Wiley & Company, Baltimore, Md.

CLUTCHES
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind

CONCENTRATORS—Sulphuric Acid
Chemical Construction Corp., New York City.
Fairlie, Andrew M., Atlanta, Ga.

CONDITIONERS AND FILLERS
American Limestone Co., Knoxville, Tenn.
Dickerson Co., The, Philadelphia, Pa.
Phosphate Mining Co., The, New York City

CONTACT ACID PLANTS
Chemical Construction Corp., New York City

COPPER SULPHATE
Tennessee Corporation, Atlanta, Ga.

COTTONSEED PRODUCTS
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Huber & Company, New York City
Jett, Joseph C., Norfolk, Va.
McIver & Son, Alex. M., Charleston, S. C.
Schmaltz, Jos. H., Chicago, Ill.
Wellmann, William E., Baltimore, Md.

CRANES AND DERRICKS
Hayward Company, The, New York City.
Link-Belt Company, Philadelphia, Chicago.
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American Agricultural Chemical Co., New York City
American Cyanamid Co., New York City.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Jett, Joseph C., Norfolk, Va.
Wellmann, William E., Baltimore, Md.

DENS—Superphosphate
Chemical Construction Corp., New York City.
Stedman's Foundry and Mach. Works, Aurora, Ind.

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DUMP CARS
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DUST COLLECTING SYSTEMS
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ELECTRIC MOTORS AND APPLIANCES
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ELEVATORS
Atlanta Utility Works, East Point, Ga.
Link-Belt Company, Philadelphia, Chicago.
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ELEVATORS AND CONVEYORS—Portable
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Sackett & Sons Co., The A. J., Baltimore, Md.

ENGINEERS—Chemical and Industrial
Chemical Construction Corp., New York City.
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Stedman's Foundry and Mach. Works, Aurora, Ind.

ENGINES—Steam
Atlanta Utility Works, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.

EXCAVATORS AND DREDGES—Drag Line and Cableway
Hayward Company, The, New York City.
Link-Belt Company, Philadelphia, Chicago.
Link Belt Speeder Corp., Chicago, Ill., and Cedar Rapids, Iowa.

FERTILIZER MANUFACTURERS
American Agricultural Chemical Co., New York City.
American Cyanamid Company, New York City.
Armour Fertilizer Works, Atlanta, Ga.
Farmers Fertilizer Company, Columbus, Ohio.
International Minerals and Chemical Corporation, Chicago, Ill.
Phosphate Mining Co., The, New York City.
U. S. Phosphoric Products Division, Tennessee Corp., Tampa, Fla.

FISH SCRAP AND OIL
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
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GARBAGE TANKAGE
Wellmann, William E., Baltimore, Md.

GEARS—Machine Moulded and Cut
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Stedman's Foundry and Mach. Works, Aurora, Ind.

GEARS—Silent
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.

GELATINE AND GLUE
American Agricultural Chemical Co., New York City.

GUANO
Baker & Bro., H. J., New York City.

HOISTS—Electric, Floor and Cage Operated, Portable
Hayward Company, The, New York City.

HOPPERS
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Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Wellmann, William E., Baltimore, Md.

IRON SULPHATE
Tennessee Corporation, Atlanta, Ga.

INSECTICIDES
American Agricultural Chemical Co., New York City.

LACING—Belt
Sackett & Sons Co., The A. J., Baltimore, Md.

LIMESTONE
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American Limestone Co., Knoxville, Tenn.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
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McIver & Son, Alex. M., Charleston, S. C.
Wellmann, William E., Baltimore, Md.

LOADERS—Car and Wagon, for Fertilizers
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.

MACHINERY—Acid Making
Atlanta Utility Works, East Point, Ga.
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Chemical Construction Corp., New York City.
Duriron Co., Inc., The, Dayton, Ohio.
Fairlie, Andrew M., Atlanta, Ga.
Monarch Mfg. Works, Inc., Philadelphia, Pa.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

MACHINERY—Coal and Ash Handling
Hayward Company, The, New York City.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.

MACHINERY—Elevating and Conveying
Atlanta Utility Works, East Point, Ga.
Hayward Company, The, New York City.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

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Sackett & Sons Co., The A. J., Baltimore, Md.
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MAGNETS
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MANGANESE SULPHATE
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MIXERS
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Stedman's Foundry and Mach. Works, Aurora, Ind.

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Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Barrett Division, The, Allied Chemical & Dye Corp., New York City.
Bradley & Baker, New York City.
Chilean Nitrate Sales Corp., New York City.
Huber & Company, New York City.
International Minerals & Chemical Corporation, Chicago, Ill.
McIver & Son, Alex. M., Charleston, S. C.
Schmaltz, Jos. H., Chicago, Ill.
Wellmann, William E., Baltimore, Md.

NITRATE OVENS AND APPARATUS
Chemical Construction Corp., New York City.

NITROGEN SOLUTIONS
Barrett Division, The, Allied Chemical & Dye Corp., New York City.

NITROGENOUS ORGANIC MATERIAL
American Agricultural Chemical Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
DuPont de Nemours & Co., Wilmington, Del.
Huber & Company, New York City.
International Minerals & Chemical Corporation, Chicago, Ill.
McIver & Son, Alex. M., Charleston, S. C.
Smith-Rowland Co., Norfolk, Va.
Wellmann, William E., Baltimore, Md.

NOZZLES—Spray
Monarch Mfg. Works, Philadelphia, Pa.

PACKING—For Acid Towers
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Chemical Construction Corp., New York City.

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McIver & Son, Alex. M., Charleston, S. C.
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Schmaltz, Jos. H., Chicago, Ill.
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Virginia-Carolina Chemical Corp. (Mining Dept.), Richmond, Va.
Wellmann, William E., Baltimore, Md.

PIPE—Acid Resisting
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PIPES—Chemical Stoneware
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PIPES—Wooden
Stedman's Foundry and Mach. Works, Aurora, Ind.

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Chemical Construction Corp., New York City.
Fairlie, Andrew M., Atlanta, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.

POTASH SALTS—Dealers and Brokers
American Agricultural Chemical Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Huber & Company, New York City.
International Minerals & Chemical Corporation, Chicago, Ill.
Jett, Joseph C., Norfolk, Va.
Schmaltz, Jos. H., Chicago, Ill.
Wellmann, William E., Baltimore, Md.

POTASH SALTS—Manufacturers
American Potash and Chem. Corp., New York City.
Potash Co. of America, New York City.
International Minerals & Chemical Corp., Chicago, Ill.
United States Potash Co., New York City.

PULLEYS AND HANGERS
Atlanta Utility Works, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

PUMPS—Acid-Resisting
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Duriron Co., Inc., The, Dayton, Ohio.
Monarch Mfg. Works, Inc., Philadelphia, Pa.

PYRITES—Brokers
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., New York City.
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SHOVELS—Power
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Chemical Construction Corp., New York City.
Fairlie, Andrew M., Atlanta, Ga.

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UREA
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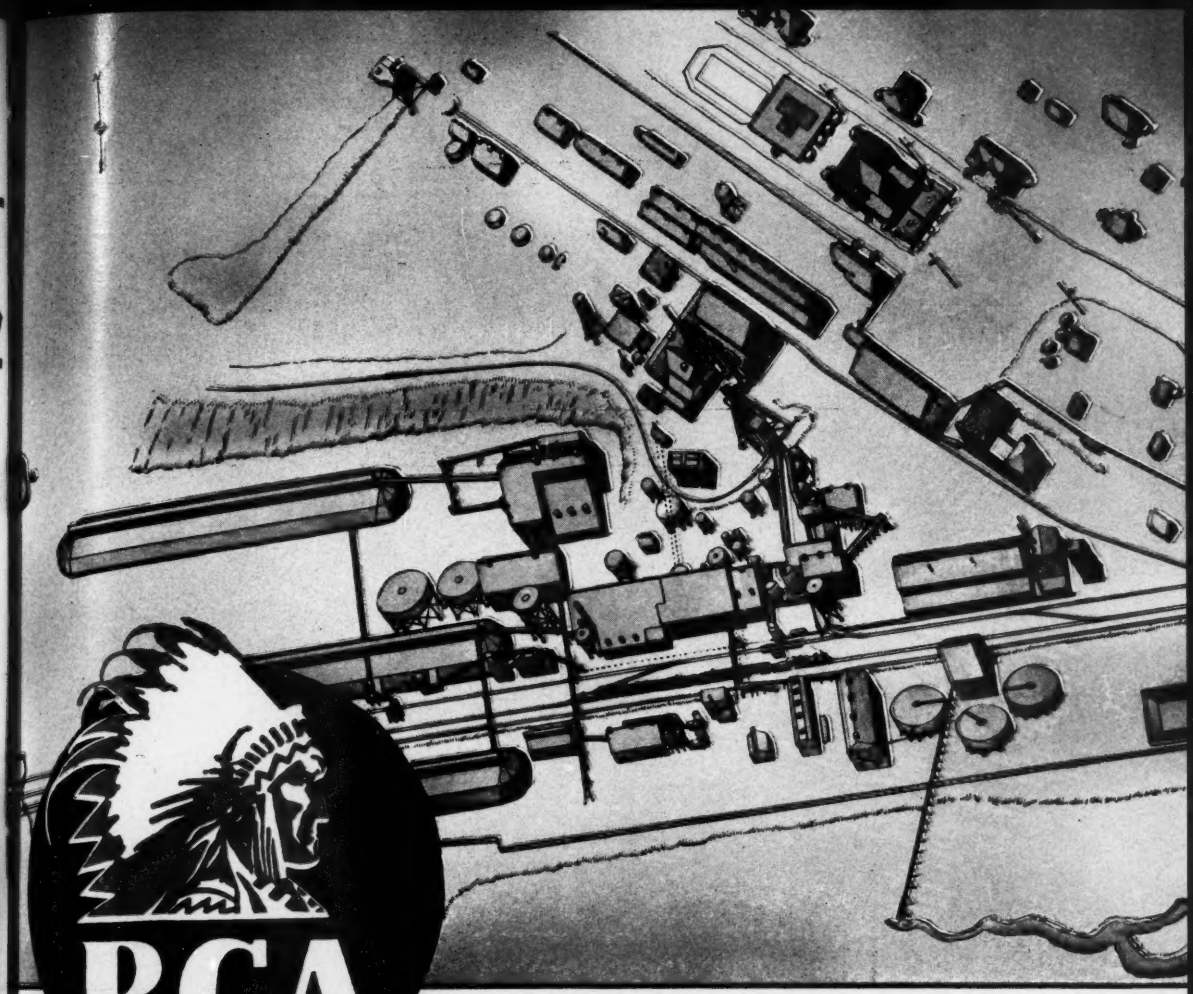

Above is a bird's eye view of the plant at Carlsbad, N. M. where Potash Company of America mines and refines its products.

And at left is the Red Indian trade-mark of Potash Company of America which identifies Potash products of uniformly high quality.

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